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Charts at the end of each technical section. The task numbers reported in Appendix B are those from the associated R&D Milestone Chart Production Pr	· Appendix Blok	novuo th	as linkages of all the inputs o	nd outputo	from vario	ua taabaisal a	actions of	the MVDD to	one enet	har Tha	no inputo	and autaut	o oro oloo	roported	in the DOD	Milootopo
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Production P2	Toddellon	' '											2,0			
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Production P10 from biomass at the plant gate. 5 Assessment of cost and performance requirements for off-board storage systems. 4 2006 1 12 6 2 Hydrogen contaminant			making hydrogen for \$1 90/kg	4	2009											
Delivery D1 performance requirements for off-board storage systems. 4 2006 1 12 6 2	Production	P10		·		5							5			
Delivery D1 performance requirements for off-board storage systems. 4 2006 1 12 6 2					-											
Delivery D1 board storage systems. 4 2006 1 12 6 2																
Hydrogen contaminant	Deliverv	D1	performance requirements for off- board storage systems.	4	2006	1			12						6	2
Delivery D2 composition and issues. 4 2006 1,2,3,4,5,6 12 12	•		Hydrogen contaminant													
	Delivery	D2	composition and issues.	4	2006	1,2,3,4,5,6			12							

						Produc- tion	Delivery	Storage	Fuel Cells	Safety	Codes & Stds	Tech Valid'n	Educa- tion	Systems Analysis	Systems Integ'tion
Output From	#	Title	Quarter	FY	Task	Task	Task	Task	Task	Task	Task	Task	Task	Task	Task
Delivery	D3	Hydrogen delivery infrastructure analysis results.	4	2006	1							6		6	3
Delivery	D4	Assessment of impact of hydrogen quality requirements on cost and performance of hydrogen delivery.	3	2007	2,3,4,5,6									6	3
Delivery	104	Compression technology	3	2007	2,3,4,5,0									O O	3
Delivery	D5	recommended for validation.	2	2009	2							2,3			
Delivery	D6	Update of hydrogen quality requirements.	4	2009	2,3,4,5,6									6	5
Delivery	D7	Recommended liquefaction technology for potential validation.	2	2009	3							2,3			
Delivery	D8	Recommended pipeline technology for validation.	2	2009	4							2			
Delivery	D9	Off-board storage technology.	2	2009	6			12				2,3			
		Report on compressed and cryogenic liquid storage tanks and evaluation against 1.5													
Storage	St1	kWh/kg and 1.2 kWh/L.	4	2006	1							1			
Storage	St2	Report on advanced compressed/cryogenic tank technologies.	4	2009	2							1			
J		Report on metal hydride system													
Storage	St3	and evaluation against 2007 targets	2	2007	3				9			1,2			
Ciorago	0.0	Report on full-cycle chemical hydrogen system and evaluation		2001	Ü							1,2			
Storage	St4	against 2010 targets.	1	2011	8		5,6		9			1			
Storage	St5	Baseline hydrogen on-board storage system analysis results including hydrogen quality needs and interface issues.	1	2007	12		6							6	2
		Final On-board hydrogen storage system analysis results of cost and performance; and down- select to a primary on-board	,												_
Storage	St6	storage system candidate.	1	2010	12		6							6	2
		Research results of advanced													
Fuel Cells	F1	reformer development.	4	2007	8	1,2		\sqcup		<u> </u>					
Fuel Cells	F2	Develop preliminary hydrogen quality requirements	2	2005	10										5
Fuel Cells	F3	Provide automotive stack test data from documented sources indicating durability status.	4	2006	10							1			
Fuel Cells	F4	Verify short-stack cold start (-20°C) to 50% of rated power in 60 seconds.	1	2008	10							1			

						Produc- tion	Delivery	Storage	Fuel Cells	Safety	Codes & Stds	Tech Valid'n	Educa- tion	Systems Analysis	Systems Integ'tion
Output From	#	Title	Quarter	FY	Task	Task	Task	Task	Task	Task	Task	Task	Task	Task	Task
Fuel Cells	F5	Provide automotive stack test data from documented sources indicating durability status.	2	2011	10							1			
		Validate maximum fuel cell													
Tech Val	V1	system efficiency.	4	2006	1				10						
Tech Val	V2	Final report for first generation vehicles and interim progress report for second generation vehicles, on performance, safety, and O&M.	3	2007	1									6	4
Toob Vol	\/2	Technology Status Report & Re- Focused R&D	4	2007	1 2 1									6	4
Tech Val	V3	Recommendations. Final report for second	4	2007	1, 2.1								_	6	4
Tech Val	V4	generation vehicles, on performance, safety, and O&M.	3	2010	1									6	4
		Technology Status Report & Re- Focused R&D	,												
Tech Val	V5	Recommendations. Validate Cold Start-Up capability	4	2010	1, 2.1									6	4
Tech Val	V6	(in a vehicle with an 8-hour soak) meeting 2005 requirements (specify cold-start energy).	3	2011	1				9						
Toon van	1.0	Final report on infrastructure and hydrogen quality for first	Ŭ	2011											
Tech Val	V7	generation vehicles.	3	2007	2.1									6	5
Tech Val	V8	Final report on infrastructure, including impact of hydrogen quality for second generation vehicles.	3	2010	2.1									6	5
Toon var		Final report on safety and O&M		2010											
Tech Val	V9	of three refueling stations.	4	2007	2.2	1,2,3	2,3,4,5,6	12		3	4		1,9	6	5
Tech Val	V10	Hydrogen refueling station analysis - proposed interstate refueling station locations.	2	2005	1.3 & 2.5									6	2
Tech Val	V10	Composite results of analyses & modeling from vehicle and infrastructure data collected under the learning demonstration project.	4	2007	1.3 & 2.5									6	2
Tech Val	V12	Final composite results of analyses & modeling from vehicle and infrastructure data collected under the learning demonstration project.	4	2010	1.3 & 2.5									6	2
I GUII V AI	V 12	final report for 3500 hour		2010										U	
Tech Val	V13	durability test overall report	4	2014	1.3 & 2.5										4

						Produc- tion	Delivery	Storage	Fuel Cells	Safety	Codes & Stds	Tech Valid'n	Educa- tion	Systems Analysis	Systems Integ'tion
Output From	#	Title	Quarter	FY	Task	Task	Task	Task	Task	Task	Task	Task	Task	Task	Task
Tech Val	V14	Report on the status of validation of 5000 hour durability target and cold start capability	2	2016	1.3 & 2.5				9						4
Tech Val	V15	composite data products for infrastructure report	2	2016	1.3 & 2.5										
C&S	C1	Training modules for current practices.	2	2005	1								1,9		
C&S	C2	Training modules for amended practices for new technologies.	2	2006	1								1,9		
C&S	C3	Preliminary Assessment of Safety, Codes and Standards requirements for the hydrogen delivery infrastructure.	2	2005	4	1,2,3	1,2,3,4,5,6								
C&S	C4	Standards for compressed gaseous on-board storage.	4	2005	4			12							
C&S	C5	Completed hydrogen fuel quality standard as ISO Technical Specification.	3	2006	4	1,2,3	1,2,3,4,5,6	12	9			1,2		6	5
C&S	C6	Technical assessment of Standards requirements for metallic and composite bulk storage tanks.	3	2006	4		1,3,5,6	12				1,2			
C&S	C7	Final standards (balloting) for fuel dispensing systems (CSA America).	4	2006	4		2,5,6	12				1,2,3			
C&S	C8	Draft standards (balloting) for refueling stations (NFPA).	4	2006	4		1,2,5,6					2,3			
C&S	C9	Materials compatibility technical reference.	2	2008	4		4,6	12							
C&S	C10	Final draft standard (balloting) for portable fuel cells (UL).	4	2008	4				8						
C&S	C11	Codes and Standards for Delivery Infrastructure complete.	2	2010	4		2,3,4,5,6								
C&S	C12	Final Hydrogen fuel quality standard as ISO Standard.	2	2010	4	1,2,3,5	2,3,4,5,6	12	9			1,2		6	5
Safety	Sf1	Report of common accident scenarios.	3	2005	1								1,9		
Safety	Sf2	Updated report of common accident scenarios.	3	2007	1								1,9		
Safety	Sf3	Safety requirements and protocols for refueling.	2	2005	3	1,2,3	1,2,5,6	12				1,2			
Safety	Sf4	Safety requirements for onboard storage.	4	2005	3			12				1			
Safety	Sf5	Safety requirements and protocols for refueling.	2	2010	3	1,2,3	2,5,6	12				1,2			

						Produc- tion	Delivery	Storage	Fuel Cells	Safety	Codes & Stds	Tech Valid'n	Educa- tion	Systems Analysis	Systems Integ'tion
Output From	#	Title	Quarter	FY	Task	Task	Task	Task	Task	Task	Task	Task	Task	Task	Task
Safety	Sf6	Sensor meeting technical targets.	4	2007	4							1,2			5
Safety	Sf7	Final peer reviewed Best Practices Handbook.	4	2007	7							1,2	1,9		2
Education	E1	Hydrogen Baseline Knowledge Survey Report	4	2004	4,9					7					
Education	E2	Hydrogen Knowledge Survey	1	2008	4,9					7					
Education	E3	Hydrogen Knowledge Survey	1	2011	4,9					7					
Systems Analysis	A1	Complete technoeconomic analysis on production and delivery technologies currently being researched to meet overall Program hydrogen fuel objective.	2	2007	1	1,2,3,5	2,3,4,5,6								2
Systems Analysis	A2	issue a report on the infrastructure analysis for the transition	2	2010	1	1,2,3,5	2,3,4,5,6	12	9		4	1,2			2
Systems Analysis	A3	issue a "readiness" report on the status of the technologies and infrastructure to meet the demands for the transition phase to a hydrogen economy	1	2011	1										2
Systems Analysis	A4	Issue a report on the results of the infrastructure analysis for the long term technologies and requirementsfor the 2015 technology readiness milestone	2	2015	1										2
Systems Analysis	A5	Issue the results of the "readiness" study for the 2015 technology readiness milestone	4	2015	1										2
Systems Analysis	A6	Issue report of the environmental analysis of the Hydrogen Program	4	2015	1										2